98-D-126, Accelerator Production of Tritium, Various Locations

(Changes from FY 1998 Congressional Budget Request are denoted with a vertical line [|] in the left margin.)

Significant Changes

In December, 1998 the Department selected the Commercial Light Water Reactor (CLWR) to serve as the primary source of tritium with APT to be developed as a backup capability. As backup, a development and demonstration program and preliminary design of the APT plant will be completed. Capital funding is necessary in FY 2000 to continue preliminary design of the APT plant. Detailed planning for APT as backup is underway. This budget request is based on best available planning information.

The FY 1999 budget request for the Tritium Supply Program was $157,000,000 in operating funds to pursue the tritium option selected by the Department in December 1998. No capital funding was requested. Congress appropriated $167,000,000 (operating). To fund necessary APT design activities in FY 1999, the Department requested $20,000,000 of the $167,000,000 operating funds be reprogrammed to capital funds. Approval of the reprogramming was granted in January 1999.

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 1998 Budget Request *(Preliminary Estimate)*	1Q 1998	4Q 2002	NA	NA	NA	NA
FY 1999 Budget Request [a]	NA	NA	NA	NA	NA	NA
FY 2000 Budget Request *(Current Baseline Estimate)* [b]	1Q 1998	4Q 2001	NA	NA	144,865	660,616

[a] The FY 1999 budget request for the Tritium Supply Program was $157,000,000 in operating funds to pursue the tritium option selected by the Department in December 1998. No capital funding was requested. Congress appropriated $167,000,000 (operating). To fund necessary APT design activities in FY 1999, the Department requested $20,000,000 of the $167,000,000 be reprogrammed to capital funds. Approval of the reprogramming was granted January 1999.

[b] The FY 2000 budget request is based on selection of APT as backup to the primary tritium production source. As backup, development and demonstration and preliminary design of the APT plant will be completed. Capital funding requested for FY 2000 is necessary to continue preliminary design activities.

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
Design			
1998	67,865	67,865	36,722
1999	20,000 [c]	20,000	46,157
2000	31,000 [d]	31,000	38,795
2001	26,000	26,000	23,191
Total	144,865	144,865	144,865

3. Project Description, Justification and Scope

In December, 1998 the Department selected the CLWR to serve as the primary source of tritium with APT to be developed as a backup capability. As backup, an engineering development and demonstration program and preliminary design of the APT plant will be completed.

Tritium is a radioactive isotope of hydrogen used in all of the Nation's nuclear weapons. Without tritium, nuclear weapons will not work as designed. At present, no tritium is produced by the U.S. for the nuclear weapons stockpile. Radioactive decay depletes the available tritium by approximately 5.5% each year. A tritium production capability is required to maintain the nuclear defense structure.

The Secretary of Energy issued a Record of Decision for the Tritium Supply and Recycling Final Programmatic Environmental Impact Statement on December 5, 1995. That Record of Decision announced a plan to pursue a dual track production scenario to ensure an adequate tritium supply, which authorized work to 1) design, build, and test critical components of an accelerator system for tritium production; and 2) purchase an existing CLWR or irradiation services with an option to purchase the reactor for conversion to a defense facility.

On December 22, 1998 the Department selected CLWR to serve as the primary source of tritium with APT to be developed as a backup capability. As such APT must be prepared to be activated as the primary source relatively quickly for some years. To meet this mission the project will complete an engineering development and demonstration program and complete preliminary design for an accelerator-based plant to produce tritium. As the backup, the APT project continues two major activities: 1) the development and demonstration of key components of the linear accelerator and target/blanket

[c] The FY 1999 budget request for the Tritium Supply Program was $157,000,000 in operating funds to pursue the tritium option selected by the Department in December 1998. No capital funding was requested. Congress appropriated $167,000,000 (operating). To fund necessary APT design activities in FY 1999, the Department requested $20,000,000 of the $167,000,000 be reprogrammed to capital funds. Approval of the reprogramming was granted January 1999.

[d] The FY 2000 budget request is based on selection of APT as backup to the primary tritium production source. As backup, development and demonstration and preliminary design of the APT plant will be completed. Capital funding requested for FY 2000 is necessary to continue preliminary design activities.

technologies, and 2) the preliminary design of the APT plant. The program will complete its work in an orderly manner over a period of three years. At the end of that period the program will have proved all major technologies and produced a preliminary design of the plant with prototype designs for a few items advanced beyond preliminary design. Together these results and a site specific Environmental Impact Statement will make it possible, if necessary, to quickly start construction and to build an APT plant in a relatively short period of time. The three year period for completion of engineering development and demonstration and design will avoid an abrupt stop with concomitant major personnel layoffs.

Development activities include: demonstration of integrated high-power operation of the Low Energy Demonstration Accelerator (LEDA) up to 8 MeV, fabrication and high-field testing of a prototypic superconducting radio-frequency cryomodule and the high-power couplers that bring RF power into the superconducting cavities, materials performance analysis, target/blanket development, and validation of neutron and tritium production codes. The results of the development and demonstration program will be fully documented. Facilities with radioactive material will be cleaned up following completion of testing.

Preliminary design packages will be developed for each major facility subsystem and prototype design (with drawings) will be completed for a few key components needed early in construction. A Preliminary Design report will be prepared to fully document the design. Necessary environment, safety and health analysis and documentation will be completed to facilitate a rapid start of construction.

Project Milestones

FY 1998: Begin engineering design of the APT plant

Complete Modular Design Study of the APT plant

FY 1999: Continue engineering development and demonstration activities, including:

- Demonstration of radio frequency quadrupole operation

Complete Environmental Impact Statement for the Savannah River Site

Continue engineering design of the accelerator, target/blanket, and balance of plant facilities

FY 2000: Continue engineering development and demonstration activities

Continue engineering design of the accelerator, target/blanket, and balance of plant facilities

4. Details of Cost Estimate

(dollars in thousands)

	Current Estimate [e]	Previous Estimate [f]
Design Phase		
Preliminary and Final Design costs (Design Drawings and Specifications)	108,649	254,566
Design Management Costs (6.0% of TEC)	8,692	26,567
Project Management Costs (5.0% of TEC)	7,243	22,139
Total Design Cost (86.0% of TEC)	124,584	303,272
Contingencies		
Design Phase (14.0% of TEC)	20,281	139,505
Total Line Item Cost [g]	144,865	442,777

5. Method of Performance

A multi-laboratory project team led by Los Alamos National Laboratory and supported by the Prime Contractor, Burns and Roe Enterprises, Incorporated (BREI), and the Savannah River Site Operator, Westinghouse Savannah River Company, are responsible for engineering development and demonstration. Other participating Laboratories include Brookhaven National Laboratory, Lawrence Livermore National Laboratories, Sandia National Laboratory, Pacific Northwest National Laboratory, Idaho National Engineering Laboratory, Thomas Jefferson National Accelerator Facility, and Oak Ridge National Laboratory.

The APT Prime Contractor (BREI), under a competitive bid cost-plus-incentive fee contract to the Department is responsible for the design of the plant. The Prime Contractor is performing the design with support from the project team, subcontractors, and consultants as necessary.

[e] The Current Estimate is based on selection of APT as backup to the primary tritium production source. The estimate is the cost of completing preliminary design.

[f] The FY 1998 Budget Request was for design only of the APT plant. This estimate includes the full cost of preliminary and final design, based on preconceptual design estimates. Construction is not included.

[g] Escalation rates taken from the FY 2000 DOE escalation multiplier tables issued with the current budget calls.

6. Schedule of Project Funding

(dollars in thousands)

	Prior Years	FY 1998	FY 1999	FY 2000	FY 2001	Outyears	Total
Total project costs							
Total facility costs							
Design [h]	0	67,865	20,000	31,000	26,000	0	144,865
Total facility costs (Federal and Non-Federal)	0	67,865	20,000	31,000	26,000	0	144,865
Other project costs							
Conceptual design cost [i]	38,611	0	0	0	0	0	38,611
NEPA documentation [j]	3,650	2,000	1,000	0	0	0	6,650
Other ES&H costs [k]	14,139	9,000	2,000	2,000	2,000	2,000	31,139
Other project related costs [l]	128,100	120,251	82,000	55,000	33,000	21,000	439,351
Total other project costs	184,500	131,251	85,000	57,000	35,000	23,000	515,751
Total project costs	184,500	199,116	105,000	88,000	61,000	23,000	660,616

7. Related Annual Funding Requirements

(dollars in thousands)

	Current Estimate [m]	Previous Estimate [n]
Related annual costs		
Total related annual costs	NA	NA

[h] Preliminary design packages will be developed for each major facility subsystem and prototype design will be completed for a few key components needed early in construction.

[i] The APT Conceptual Design Report was completed April 1997.

[j] NEPA documentation costs include permitting/licensing, and preparation of the APT Environmental Impact Statement for the Savannah River Site.

[k] Other ES&H costs include the safety analysis/assessments, preliminary safety analysis reports, technical safety requirements, and safety reviews. Necessary environmental, safety and health analysis and documentation will be completed to facilitate rapid start of construction (if needed in the future).

[l] Other project related costs include engineering development and demonstration and program / project management.

[m] Annual operating costs are not applicable to APT as backup.

[n] Annual operating costs are not applicable because the FY 1998 Budget Request was for design only of the APT plant.